

spark ignition. Indeed, his invention requires high-octane fuel in order to prevent early ignition due to compression temperature. (See Abstract and column 3, lines 52-53.) In contrast, the present invention utilizes compression ignition without a spark and is designed to operate on a wide range of fuels and fuel grades.

Second, Cataldo purports to achieve constant temperature combustion through the shape of the combustion chamber. All of the fuel is added during the compression stroke and is ignited by firing a spark plug (column 2, lines 39-45; column 3, lines 1-15 and 40-45). In contrast, once combustion is initiated in the present invention (by compression temperature); constant temperature combustion is achieved through the injection rate of additional fuel during the combustion process.

The Examiner suggests that the cycle taught by Cataldo having a compression process 1-2, constant pressure heat addition process 2-3, constant temperature heat addition 3-4, adiabatic expansion process 4-5, and heat removal process 5-1 at constant volume is the same as the present invention. Applicant respectfully disagrees. The present invention clearly utilizes an over-expanded expansion stroke for increased thermal efficiency. The compression process takes place in two steps; first by an external compressor and then by changing volume within the cylinder, such that the expansion stroke is significantly greater than the compression stroke. In contrast, Cataldo's approach actually results in a shorter effective expansion stroke because a portion of the combustion process occurs during the expansion stroke, while utilizing conventional intake and exhaust valve opening/closing timing. The adiabatic expansion process 4-5 in Cataldo is actually much shorter than the compression process 1-2.

Furthermore, Cataldo does not teach or suggest a compressor to provide air to the engine as required by present claims 1 and 11. Nor does Cataldo teach or suggest a first and second heat

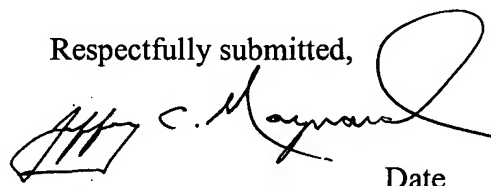
removal process as required by claim 1 or a volume change during the heat removal process as required by claim 8.

Finally, Cataldo describes his invention as an improvement on the Otto cycle (column 1, lines 15-18; column 4 lines 10-16), which is a well known four-stroke engine cycle. The present invention utilizes a two-stroke cycle, specifically required in claims 12-14. Given the extended combustion process taking place during a portion of the expansion stroke in Cataldo, it could not be adapted to a two-stroke operation

### CONCLUSION

Applicant has made a diligent effort to address the rejections identified by the Examiner and respectfully submits that the outstanding rejections in the Office Action have been overcome. In view of the above remarks, all pending claims are believed to be patentable, and thus, the case is in condition for allowance. Accordingly, a Notice of Allowability is respectfully requested at the Examiner's earliest convenience. In the event that there is any question concerning this response, or the application in general, Applicant respectfully requests that the Examiner contact Applicant's attorney at the telephone number listed below so that additional changes may be discussed.

Respectfully submitted,

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Date

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